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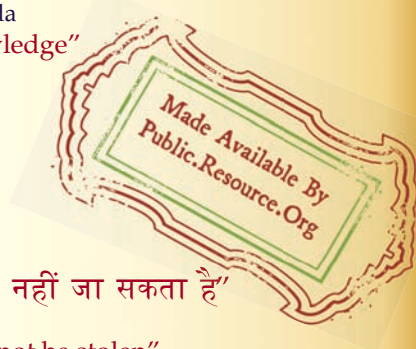
IS 3571 (1985): Dental gold solders [MTD 10: Precious Metals]



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*Indian Standard*  
SPECIFICATION FOR  
DENTAL GOLD SOLDERS  
( *First Revision* )

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**INDIAN STANDARDS INSTITUTION**  
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
NEW DELHI 110002

# Indian Standard

## SPECIFICATION FOR DENTAL GOLD SOLDERS

### ( First Revision )

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*Indian Standard*  
**SPECIFICATION FOR  
DENTAL GOLD SOLDERS**  
*( First Revision )*

**0. FOREWORD**

**0.1** This Indian Standard ( First Revision ) was adopted by the Indian Standards Institution on 31 January 1985, after the draft finalized by the Precious Metals Sectional Committee had been approved by the Structural and Metals Division Council.

**0.2** Soldering is vital to dentistry for joining parts of an assembly as in assembling a bridge and for building up or adding to the bulk of certain structures, such as the establishment of contact on inlays and crowns with adjacent teeth. Solders used for the latter purpose is sometimes known as building solders. This standard has been prepared to guide the industry and the dentist in selecting the right quality of gold solders. Some typical composition ranges and mechanical properties of dental gold solders are given for information in Appendix A and Appendix B, respectively.

**0.2.1** Lower carat solders have not been recommended in this standard as they have lower corrosion and tarnish resistance. Consequently, appliances joined by such solders will be unfit to remain continuously in the mouth. Lower carat solders are preferred for orthodontic soldering, since high temperatures may affect adversely the physical properties of wires used in constructing appliances. Tarnish and corrosion are not serious factors because these appliances are not worn for extended periods. Reference may be made to IS : 3095-1965\* for low carat solders.

**0.3** The standard was first published in 1966. Based on the experience gained during the years the standard have been revised. In this revision the following modifications have been made:

- a) Three more grades have been added in Appendix A, and
- b) Appendix B giving mechanical properties have been added.

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\*Specification for solders for use in goldware.

**0.4** For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960\*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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## **1. SCOPE**

**1.1** This standard covers the requirements for dental gold solders.

## **2. SUPPLY OF MATERIAL**

**2.1** General requirements relating to the supply of material shall conform to IS : 1387-1967†.

## **3. MANUFACTURE**

**3.1** Fine gold as prescribed in IS : 1417-1981‡ shall be used for the manufacture of gold solders. For alloying purposes, virgin metal or such clean scrap as may result from the manufacture of solder shall be used.

## **4. GOLD CONTENT**

**4.1** The gold content of dental gold solders, when assayed in accordance with IS : 1418-1972§, shall not be less than 65 percent by mass of gold.

## **5. FORM AND SIZE**

**5.1** Dental gold solders shall be made in the form of wire, strip or plate of 1.60 mm minimum diameter or thickness. The following masses of solders are recommended:

5g, 10g, 20g, 50g and 100g.

## **6. FREEDOM FROM DEFECTS**

**6.1** Solder shall be uniform in colour and quality and shall be clean, bright and smooth. It shall be free from ragged edges, damaged ends and adhering materials.

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\*Rules for rounding off numerical values (*revised*).

†General requirements for the supply of metallurgical materials (*first revision*).

‡Grades of gold and gold alloys (*second revision*).

§Method for assaying of gold in gold and gold alloys (*first revision*).

## 7. MEETING RANGE

7.1 The material shall pass the test prescribed in Appendix C.

## 8. SOLDERABILITY

8.1 The material shall pass the test prescribed in Appendix D.

## 9. SAMPLING

9.1 The purchaser or his representative may, if he so desires, select samples at the supplier's expense for chemical analysis. The cost of chemical analysis shall be borne by the purchaser.

9.2 The sample for chemical analysis shall consist of a composite sample of five grams from each lot of 500 g or fraction thereof.

9.3 Samples shall be taken by shearing or clipping pieces from their entire cross-section, remelting in a clean container at a temperature slightly above the melting range, mixing thoroughly, and pouring into a cold mould of convenient size. The sample so prepared shall be milled, drilled or sawed in such a manner as to represent the entire cross-section. The saw, drill cutter or any tool used shall be thoroughly cleaned and no lubricant shall be used in the operation. The sawings or metal clips shall be treated with a magnet to remove any particle of steel introduced during the operation.

9.4 The composite sample shall meet the requirements of chemical analysis, melting range and solderability.

## 10. PACKING

10.1 The material shall be of uniform dimensions except for adjusting the mass (see 5.1). The material shall be packed in such a manner as to prevent damage during transport.

## 11. MARKING

11.1 The material or its container shall be legibly marked with gold content, net mass of the solder, melting range and name or trade-mark of the manufacturer.

11.1.1 The material may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

## APPENDIX A

( Clause 0.2 )

## COMPOSITION OF DENTAL GOLD SOLDERS

## A-1. TYPICAL COMPOSITION RANGES

**A-1.1** Typical chemical composition ranges of dental gold solders are given in Table 1.

**TABLE 1 CHEMICAL COMPOSITION RANGE OF DENTAL GOLD SOLDERS**

Sl. No.	SOLDER GRADE	CONSTITUENT, PERCENT					MELTING RANGE, °C
		Gold	Silver	Copper	Zinc	Tin	
i)	A	65.4	15.4	12.4	3.9	3.1	745 to 785
ii)	B	66.1	12.4	16.4	3.4	2.0	750 to 805
iii)	C	65.0	16.3	13.1	3.9	1.7	765 to 800
iv)	D	72.9	12.1	10.0	3.0	2.0	755 to 835
v)	E	80.9	8.1	6.8	2.1	2.0	745 to 870

NOTE — When gold, zinc and tin contents are constant and silver and copper are varied, significant differences in working characteristics are obtained with only a small change in melting points ( liquidus ). Also, changes in colour are produced. High-copper alloys have a rich gold-like colour while high-silver alloys have lighter and less gold-like colour. The melting range of high-silver alloys is relatively shorter than that of high-copper alloys. When flowed on high carat gold plate, the sharp melting solders spread freely with a minimum of attack on the plate itself. The high-copper alloys, which have a longer melting range attach themselves to the plate before they are entirely melted. On continued heating, they do not spread over the plate but alloy with it. High-silver solders are recommended because of their slow rate of attack on the pieces that are being joined. This characteristic is useful when parts are fitted and when it is important to retain original properties. The high-copper solders are useful when it is necessary to add material to a part that is deficient in size because of wear, accident or design. The composition of the general purpose solder is so chosen that it incorporates a useful compromise of build-up and flow properties.

**APPENDIX B**

( Clause 0.2 )

**MECHANICAL PROPERTIES OF DENTAL GOLD SOLDERS****B-1. TYPICAL MECHANICAL PROPERTIES**

**B-1.1** Typical mechanical properties of dental gold solders are given in Table 2.

**TABLE 2 MECHANICAL PROPERTIES OF DENTAL GOLD SOLDERS**

SOLDER GRADE	CONDITION	YIELD STRESS	TENSILE STRENGTH	ELONGATION
		MPa, <i>Min</i>	MPa, <i>Min</i>	PERCENT ON GAUGE LENGTH
A	Soft	185	295	14 <i>Min</i>
	Hard	300	430	1 <i>Max</i>
B	Soft	200	305	12 <i>Min</i>
	Hard	535	575	1 <i>Max</i>
C	Soft	205	305	9 <i>Min</i>
	Hard	530	635	1 <i>Max</i>
D	Soft	165	245	7 <i>Min</i>
	Hard	420	480	1 <i>Max</i>
E	Soft	140	255	18 <i>Min</i>

NOTE — 1 MPa = kgf/mm<sup>2</sup>.

**APPENDIX C**

( Clause 7.1 )

**MELTING RANGE TEST****C-1. PROCEDURE**

**C-1.1** Pickle a piece of gold sheet in sulphuric acid ( relative density 1.4 ), wash, allow to dry and then coat over an area of approximately 0.5 cm<sup>2</sup>, with the flux recommended by the manufacturer, or where no specific flux is recommended, with a dehydrated borax flux. Coat a small piece of the solder under test, weighing 0.05 to 0.15 g with the flux and place it on the fluxed area of the gold sheet.

**C-1.2** Place the assembly in the muffle of an electric furnace with a bare thermocouple in contact with the sheet. The temperature of the furnace shall be not higher than 100°C below the stated solidus temperature.

Raise the temperature at a rate of not more than 10°C per minute to  $15^{\circ} \pm 2^{\circ}\text{C}$  below the stated solidus temperature. Remove the assembly and examine. The solder shall show no signs of fusion.

**C-1.3** Recoat the assembly with the flux and insert again into the furnace and raise the temperature at the same rate to  $15^{\circ} \pm 2^{\circ}\text{C}$  above the stated liquidus temperature. Remove the assembly and examine. The solder shall completely fuse under these conditions.

## **A P P E N D I X D**

( *Clause 8.1* )

### **SOLDERABILITY TEST**

#### **D-1. PROCEDURE**

**D-1.1** Heat a strip 0.25 mm thick of gold alloy plate for which the solder is appropriate, to redness, pickle in dilute sulphuric acid ( relative density 1.4 ), wash with water and bend in the form of a tube of approximately 25 mm in length and 10 mm in diameter with a lapped seem of about 2 mm overlap. Apply borax flux or the flux recommended by the manufacturer to the lap.

**D-1.2** Place a small piece of the solder weighing 0.02 to 0.05 g at the middle of the lap on the inside of the tube. Hold the tube over a flame with the lap downwards until the solder runs and then allow to cool.

**D-1.3** The solder shall be deemed to have passed the test if it flows quickly along the lap and forms a strong, smooth, close union and does not open when the tube is placed in a vice, with the joint midway between the jaws, and flattened.



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